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All-terrain Robotic Excavation System (A.R.E.S.)

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All-terrain Robotic Excavation System (A.R.E.S.)

L. Mohammed, D. Albanese, P. Canseco, K. Green, Z. Kothari, S. Lower, A. McHargh, J. Netzley, M. Thames, N. Voris

Faculty Advisor: Dr. Markus Wilde, Dept. of Mechanical and Aerospace Engineering, Florida Institute of Technology

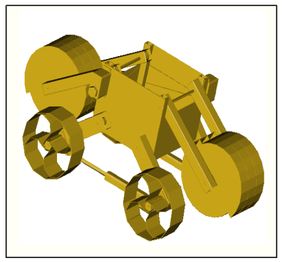
Introduction

A.R.E.S. is a multidisciplinary team that is designing and building a robot to compete in the 2016 NASA Robotic Mining Competition at Kennedy Space Center, Florida.

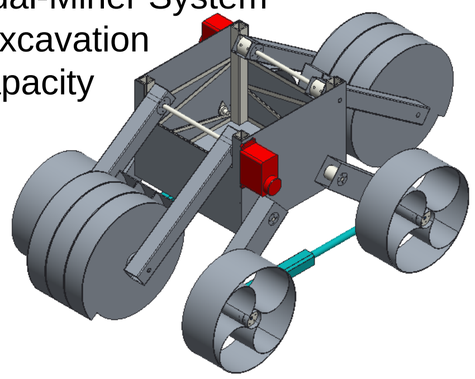
Objectives

- To compete and place first in the 2016 NASA Robotic Mining Competition
- Design and build a robot that
  - weighs under 80 kg and contained with a starting configuration of 1.5m x 0.75m x 0.75m
  - is remotely operated
  - is able to mine and deposit at least 10 kg of regolith in the allotted 10 minute competition run

Design



- Carbon Fiber Excavation Drums
  - Efficient mining ratio
  - Lightweight
  - Durable
- Adjustable Locomotion System
  - Extended depositing height
  - Increased weight distribution
  - Controlled center of gravity
- Adjustable Dual-Miner System
  - Modular excavation
  - Double capacity



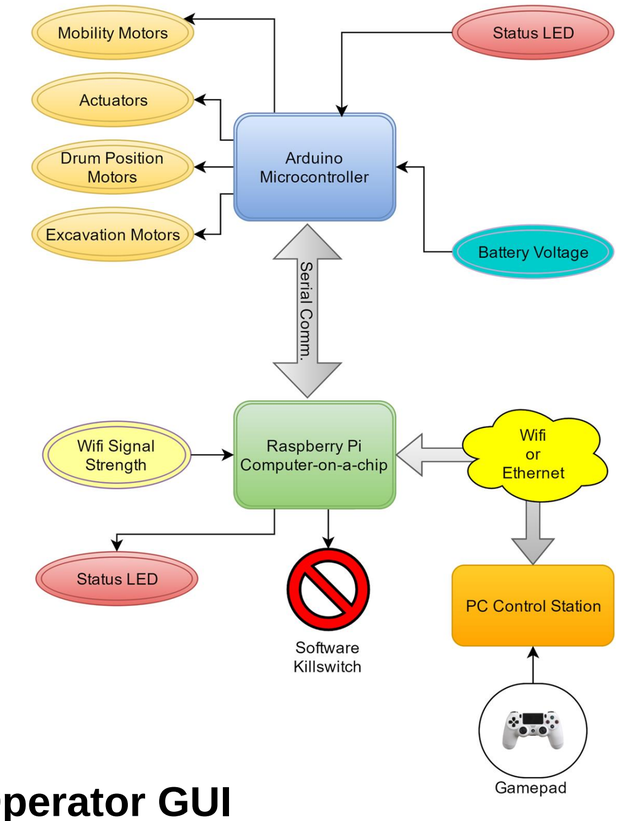
Software and Communications

- On-board computers include an Arduino and a Raspberry Pi.
- Arduino drives motors and collects data.
- Raspberry Pi does networking and system monitoring.
- The on-board network is UART Serial.
- Remote command is done with a TCP Client-Server design pattern.
- Tele-operation is done via Playstation 4 controller or Laptop User Interface.
- Remote communication happens through an ethernet or wifi link on an isolated network.

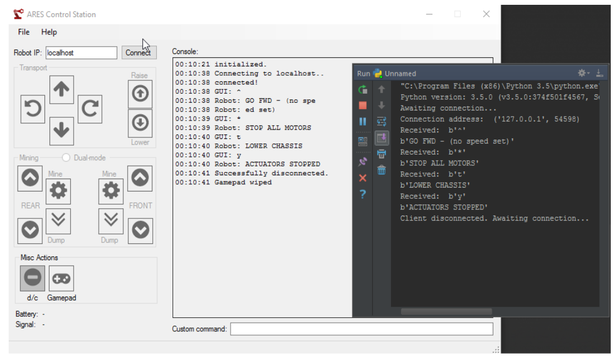
Carbon Fiber Manufacturing

- 0/90 stitch carbon fiber
- Polyester Peel Ply
- 4 oz Breather / Bleeder Cloth
- Vacuum bagging method

Control System Diagram



Operator GUI



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Fellow Students

Ronald-Dean Allado and John Breen